A Study of Blue Carbon in Jamaica Bay 2015

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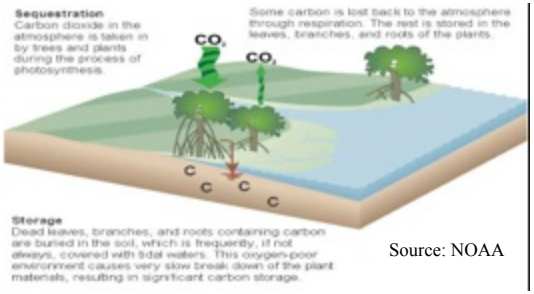
Abstract

Carbon that is sequestered in coastal ecosystems and intertidal marshes is known as "blue carbon." We investigated and analyzed sediment cores of three marshes in the Hudson Estuary to determine the amount of organic matter and carbon sequestered within them. Maps of Jamaica Bay from 250 years to the present are used to determine why there is a shift in organic matter and a decline in inorganic matter within the last estimated 300 years. We uncovered two possible impacts: i) the growth of Rockaway Spit over the last 250 years has elongated it, limiting the flow of seawater and sand into the bay, and ii) deep dredging may have altered the water flow and deposition of sediments within the bay itself.

Introduction

Wetlands play a major role in climate stability as they process and sequester large amounts of carbon. However, the quantity of carbon storage depends on the rate of production/ decomposition and the environmental stresses placed upon it. The salt marshes are an integral part of the global carbon cycle. Recent studies of Jamaica Bay marshes indicate that there are a number of stressors that include waste treatment plants, deep dredging and sea level rise. Deep dredges in the bay called "borrow pits" have created artificial depositional basins. Our work focused on the amount of organic and inorganic material in sediment cores from which we are awaiting C-14 AMS dates to calculate blue carbon sequestration through time.

Carbon's Role in the Wetlands

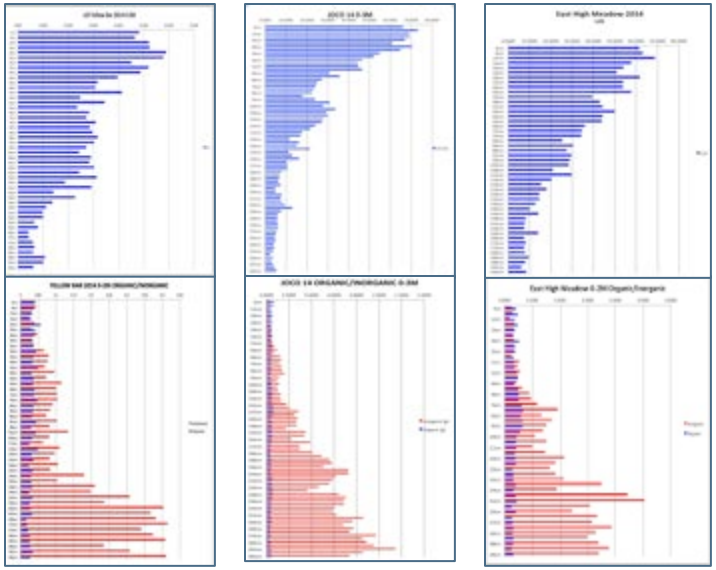


Source: NOAA

Questions

How have the organic/inorganic composition of Jamaica Bay Marshes been changing through time; and what drives these changes? What is rate of blue carbon storage through time?

Results from Yellow Bar, JoCo and East High Meadow Marsh



Methodology

Step 1: Sub-sample cores at 4cm increments.

Step 2: Dry and sample for LOI.

Step 3: Analyze the data to determine organic and inorganic g/cm^3 with depth.

Loss on Ignition (LOI)

Samples were taken at 4 cm increments from the core, dried for 24 hours at 100° C, and burned at 500° C for 2 hours.

$$\text{LOI} = \frac{\text{Dry Weight} - \text{Burned Weight}}{\text{Dry Weight}}$$

Step 4 Pick macrofossils for AMS dates to calculate carbon g/m^2/yr

Historic Maps


Library of Congress
1768

Library of Congress
1780


Harvard Geospatial Library
1849


Harvard Geospatial Library
1863


Historic Charts NOAA
1948


Google Earth 2015
2015

Conclusions

Over the past 250 to 300 years, the growth of Rockaway Spit has lessened the inundation of ocean water into the bay, probably affecting the amount of inorganic sediment carried in. This extension probably diminished the amount of inorganic sediment we find in the marsh peat. Dams on the streams entering the bay may have also limited sediment supply. The deep borrow pits created by dredging for the construction of both Floyd Bennett Field and Idlewild Airport (now John F. Kennedy International Airport) serve as artificial anthropogenic sediment sinks. Macrofossils for AMS dating, x-ray florescence, and carbon and nitrogen isotopes will aid us in calculating the rate of shifts in blue carbon and inorganic sediment through time.

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